Periscope.

a.—NORMAL HISTOLOGY OF THE NERVOUS SYSTEM.

THE DIAMETER OF NERVE FIBRES.—One of the most striking features in a transverse section of a nerve is the exceeding variability in the diameter of its fibres. Sometimes broad and narrow fibres are intimately intermingled ; sometimes bundles of narrow fibres are scattered among larger ones ; and, again, the difference is not very marked. Again and again the reason for this variability has been sought for, but thus far, as it would seem, with indifferent success. It was the endeavor to associate some specific difference in the nature of the fibres with the difference in calibre, which furnished at once the motive for research and the ground of failure. Neither the assumption that the fibres of the brain and cord are in general finer than the finest in the peripheral nerves, nor that a specific difference between the fibres of the sympathetic and the cerebro-spinal system may be found in the calibre of the fibres, nor that the motor fibres in the spinal nerve-roots are distinguishable from the sensory by their greater diameter, have stood the test of careful scrutiny. A recent publication by Pierret, in which he sets forth as a result of his investigations that the size of the ganglion cells in the brain and cord is directly proportional to their distance from the point to or from which the motor or sensory impulse is transmitted, suggested to Schwalbe[1] the possibility of a new solution of the problem which so many had fruitlessly endeavored to solve. Might not some such relation be discovered between the diameter and the length of the nerve fibres ; corresponding to this difference in the diameter of the fibres, are there differences in the diameter of the axis-cylinders ; do the nerve fibres become modified in diameter in

[1] Schwalbe: "Ueber die Kaliberverhältnisse der Nervenfasern." Leipsic, 1882.

their course outward from their origin in the brain and cord ; is the diameter modified by the size of the animal, by the physiological quality of the fibres? These are the queries which gave impulse to Schwalbe's researches.

He finds that the diameter of the nerve fibres does not stand in any definite relation to the size of the animal. His examination of the fibres in the spinal nerve-roots of the frog and man shows that *the diameter of the fibres is directly dependent upon their length.* Thus those roots through which the nerves pass to the extremities are largely made up of fibres of greater diameter than those distributed to the trunk ; while those passing to the posterior are of greater calibre than those passing to the anterior extremities, especially in the frog. The presence of narrow fibres among those of maximum diameter is readily accounted for by the circumstance that some are destined to be distributed to parts relatively near to the origin in the cord.

A curve constructed on the basis of his measurements shows in the most graphic manner this most significant fact, and since the curves constructed from measurements of both anterior and posterior roots coincide very closely, it follows that in this particular the motor and sensory fibres are essentially alike. The maximum as well as the average diameter of the motor fibres, however, is greater than that of the sensory. While an examination of the nerve-roots shows great variability in the diameter of the fibres, a study of such branches as are distributed to a limited area, *i. e.*, such as have approximately equal lengths, reveals great uniformity in diameter.

He shows furthermore that the motor nerves possess a uniform calibre from the roots outward until they commence to divide, and then while the individual branches show a diminution in diameter, the sum of the diameters of all the branches is considerably greater than the diameter of the original trunk. The sensory fibres, on the other hand, show a uniform diminution in diameter, even before division of the trunks occurs. While both motor and sensory fibres suffer a diminution in calibre from the centre outward, the motor trunks increase in diameter in the aggregate, while the sensory trunks diminish.

In regard to the diameter of the axis-cylinder, in view of the great technical difficulties in preservation and measurement, he is only able to state that, in general, the diameter of the axis-cylinder is directly proportional to that of its fibre. In view of the fact that a greater diameter of a nerve fibre indicates a greater length,

the author suggests the possibility of using this principle in the study of the course of the nerves in the brain and cord. Since, moreover, the resistance to the nervous impulse may be supposed to increase with the length of the nerve fibre, the above-described relation between the diameter and length of the fibre suggests the possibility of a physiological compensation which might well be the theme of further research.

In regard to techinque, the author remarks upon the difficulty of obtaining accurate measurements of the fibres in transverse sections, especially of the spinal nerve-roots, on account of the lack of absolute parallelism in the fibres and the consequent obliquity of sections of some of the elements. He therefore prefers and practises the measurement of the isolated fibres seen from the side, and for the isolation recommends the following methods: If a small animal, such as the frog, is used, the trunk is macerated in 20% nitric acid at 40° C. and then washed. The fibres, by this method, retain their natural diameter, but are very fragile and must be protected from pressure of the cover-glass.

If single trunks are to be examined, he suggests that they be treated for twenty-four hours with 1% osmic acid, washed, and kept in glycerine acidulated with nitric acid for some time at a temperature of 40° C. The amount of acid required is greater for the mammalia than for the amphibia. Thus, for the latter he uses 1% and macerates for twenty-four hours at 40° C.; while in the former a 3% solution is necessary, and a maceration of two or three days. The diameter of the fibres, by this method, is well preserved and the isolation easy.—T. MITCHELL PRUDDEN, M.D.

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b.—PHYSIOLOGY OF THE NERVOUS SYSTEM.

NERVES OF THE RECTUM.—Dr. Fellner has made experiments upon this point. He irritated the nervi erigentes, which caused a contraction of the longitudinal fibres of the rectum. The circular muscles of the rectum remain undisturbed. They are called into activity by nerves springing from the posterior mesenteric ganglion, and going to the hypogastric plexus. The nervi erigentes and the hypogastric nerves stand in an antagonistic relation to the rectum, similar to that of the uterus. Between the irritation of the nerve and the commencement of muscular contraction, there is a latent period of about one second.—*Centralblatt für die med. Wiss.*, 1882, No. 22.